

Application No. 09/942,391

REMARKS

The above-identified patent application has been reviewed in light of the Examiner's final Office Action dated December 3, 2004. Claims 1, 9 and 18 have been amended without intending to abandon or to dedicate to the public any patentable subject matter. No claims have been canceled. Claims 21-23 are new. Accordingly, Claims 1-23 are now pending. As set out more fully below, reconsideration and withdrawal of the rejections of the claims are respectfully requested.

Initially, Applicants would like to thank the Examiner for the courtesies extended during the telephone interview held on January 31, 2005. During that telephone interview, the disclosures of U.S. Patent No. 6,665,743 to Benhase et al. ("Benhase") and of U.S. Patent No. 6,697,713 to Hansen et al. ("Hansen") were discussed in relation to the pending claims. In addition, aspects of the subject matter related to the invention were discussed. The Examiner did indicate that claims limited to write operations involving a logical block address range that included more than one block of data might be allowable, provided of course appropriate support for such a claim limitation could be found in the specification. No definite agreement regarding allowable subject matter was reached.

Claims 1-20 stand rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 6,665,743 to Benhase et al. ("Benhase") in view of U.S. Patent No. 6,697,713 to Hansen et al. ("Hansen"). In order to establish a prima facie case of obviousness under section 103, there must be some suggestion or motivation to modify the reference teachings, there must be a reasonable expectation of success, and the prior art reference or references must teach or suggest all of the claim limitations. (MPEP §2143.) As explained in detail herein, each and every element of the invention as set forth in the claims cannot be found in the cited references, whether those references are considered alone or in combination. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. §103 are respectfully requested.

In general, the present invention is directed to reducing the amount of time required to initialize a storage system having a number of storage devices. A reduced initialization time is achieved by providing substantially equal access to a communication bus by the individual storage devices. This substantially equal access is obtained by issuing a number of write related operations to each of the drives. After it has been determined that each of the drives has completed at least one of the previously issued write operations, at least one more write related

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operation is issued to each of the drives. Furthermore, as set forth in the amended claims, the at least one more write related operation is issued to each of the drives only after it has been determined that each of the drives has completed at least one of the previously issued write operations. Accordingly, it can be appreciated that a method in accordance with embodiments of the present invention includes a determination as to whether every drive in the array has completed a previously provided write operation, and then issuing at least one additional write related operation to each of the drives in the array only if it has been determined that every drive in the array has completed at least one previously provided write operation.

The Benhase reference addresses the amount of time required to initialize an array of disks by preventing redundant initialization operations. Accordingly, Benhase provides a PCI RAID adapter that enters an "initialization override" state in which the PCI RAID adapter is inhibited from performing initialization operations. Instead, while in the "initialization override" state, the PCI RAID adapter performs full stripe writes of initialization data supplied by the storage system controller. (Benhase, col. 4, ll. 26-31.) The full stripe writes are performed in accordance with the RAID configuration being implemented. (Benhase, col. 5, ll. 23-29.) However, Benhase does not describe determining whether each drive within an array has completed a queued write operation and deferring the issuance of a next write operation until it has been determined that each drive has completed a write operation.

The Hansen reference is generally directed to improving disk drive performance by providing a seek or position queue. The position queue is a one deep queue that is filled with information regarding the position on the drive of data associated with the next operation, as soon as the next command in the command queue is determined. The information in the position queue can then be used to position the read/write head as necessary to perform the next command, while components of the disk drive perform other operations. Accordingly, Hansen is directed to improving the performance of a single disk drive. However, Hansen does not describe coordinating operations over a number of disk drives. More particularly, Hansen does not teach, suggest or describe making a determination that each drive within an array has completed a write operation before issuing a next write operation to each of the drives in an array.

Claim 1 is generally directed to a method for initializing an array of drives. In particular, Claim 1 recites "issuing a first number of write related operations to each of said drives in said

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array." Claim 1 further recites "determining whether each of said drives has completed at least one of said number of write operations." As amended, Claim 1 also recites:

in response to determining that each of said drives has not completed at least one of said number of write operations concerning at least one logical block address range, deferring issuing at least one more write related operation and continuing said determining whether each of said drives has completed at least one of said number of write operations concerning at least one logical block address range; and

in response to determining that each of said drives has completed at least one of said number of write operations . . . issuing at least one more write related operation to each of said drives in said array.

As noted in the discussion provided above, neither the Benhase nor the Hansen references teach, suggest or describe making a determination with respect to each drive in an array, and issuing an additional write operation only in response to such a determination. Accordingly, for at least these reasons, Claim 1 and dependent Claims 2-8 are not obvious over the cited references, and the rejections of those claims should be reconsidered and withdrawn.

Claim 9 is generally directed to an apparatus for initializing an array of drives. In particular, Claim 9 recites "a controller in communication with said array of drives using said bus subsystem, said controller for controlling issuance of write operations to each drive within said array." As amended, Claim 9 additionally recites that:

wherein after an initial set of write operations is issued to each of said drives within said array, an additional write operation is not issued to each of said devices in said array until at least one write operation included in said initial set of write operations has been completed on each of said drives.

As noted elsewhere herein, neither the Benhase nor the Hansen references teach, suggest or disclose controlling a third operation to a number of drives after at least one of a first or second write operation has been completed on each of the first and second drives. Therefore, for at least these reasons, Claim 9 and dependent Claims 10-17 are not obvious, and the rejections of these claims should be reconsidered and withdrawn.

Claim 18 is generally directed to a method for initializing an array of storage devices. According to Claim 18, the method includes "issuing at least first and second write related

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operations to each of said storage devices in said array." Claim 18 further recites "only in response to determining that every one of said storage devices included in said storage array has completed at least one of said at least first and second write related operation, issuing an additional write related operation to every one of said storage devices in said storage array." Neither the Benhase nor the Hansen references teach, suggest, or describe issuing additional write related operations only in response to determining that every one of the storage devices in an array has completed at least one of first and second write related operations. Accordingly, for at least these reasons, Claim 18 and dependent Claims 19 and 20 are not obvious over the cited references, and the rejections of these claims should be reconsidered and withdrawn.

New Claims 21-23 depend from Claims 1, 9 and 18, respectively, and recite that the logical block address ranges each comprise more than one logical block address. Support for these new claims can be found in the specification, for example at page 5, lines 5 through 8. It is submitted that Claims 21-23 are allowable for at least the additional reason that they further define write operations to concern logical block address ranges that comprise more than one logical block address.

The application now appearing to be in form for allowance, early notification of same is respectfully requested. The Examiner is invited to contact the undersigned by telephone if doing so would expedite the resolution of this case.

Respectfully submitted,

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